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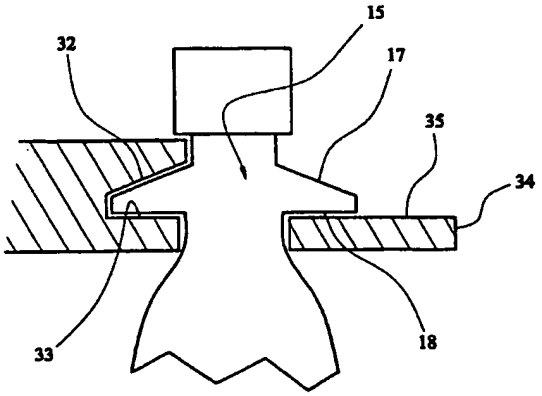
(54) Title: HANDLING APPARATUS FOR USE IN A BOTTLING PLANT TO HANDLE BOTTLES WITH NECK RINGS



(57) Abstract: A handling apparatus for use in a bottling plant to handle bottles having neck rings, comprising a rotatable feed member (11) having a shaped peripheral edge (12) which is engageable with part of the upper (17) and lower (18) engaging surfaces of each neck ring (15) to allow each bottle to be suspended from its neck ring in an upright mode, said feed member being rotatable about an upright axis extending generally parallel to the longitudinal axes of the bottles in order to feed the bottles along the predetermined guide path; and a fixed guide (21) which is curved, as seen in plan, so as to follow at least part of the path of travel of the peripheral edge of the feed member (11), and to define a guide track (50) with the feed member having an entry end (19) for receiving a train of bottles and a discharge end (20) from which the bottles can be transferred to the bottling plant, said guide providing a support on which part of the lower engaging surface of the neck ring of each bottle can be support as the bottle moves from the entry end to the discharge end of the track. A further handling apparatus comprises a star wheel (30) having a profile edge (32, 33) provided along each pocket (31) and which is engageable with part of the upper (17) and lower (18) engaging surfaces of each neck ring (15) to allow each bottle to be suspended from its neck ring in an upright mode; and a fixed guide which is curved.

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Handling Apparatus for Use in a Bottling Plant to Handle Bottles With Neck Rings

This invention relates to a handling apparatus for use in a bottling plant to handle bottles with neck rings.

In a bottling plant, it is necessary to transfer a train of bottles through various treatment stations, and which may include rinsing, feeding in predetermined sequence to a filling station, capping and delivering to a packaging station. Traditionally, bottling plants have been designed to handle glass bottles, and which usually are conveyed from one station to another with the bottle in an upright mode, so that gravity filling of the bottle can take place at the filling station, and subsequent capping with the bottle still upright to form sealed closure of the bottle.

In the supply of glass bottles to a filling station, it is necessary to provide a timed sequence of operations, so that empty bottles can be fed, one by one to the filling station, at predetermined time intervals, and so that each bottle can be filled and then moved on to the capping station. It is therefore usual, in the handling of glass bottles, to feed the bottles along guide paths with the bottles extending generally vertically, and with predetermined spacing between the bottles. Transfer mechanisms are therefore provided, in order to apply motion to a train of bottles along the guide paths, and which usually comprise so-called "star wheels", which are circular disks having peripheral shaped pockets which can engage at least part of the periphery of the main body part of a glass bottle i.e. a generally cylindrical large diameter part of the bottle below a smaller diameter neck part of the bottle which has a sealed cap fitted on it, after filling, to close the bottle.

It is usual to provide a curved fixed guide which extends partly around the periphery of each star wheel, so as to confine each main body part of a bottle in its respective pocket as the rotation of the star wheel conveys each bottle, from a bottle-receiving station at one fixed peripheral location of the star wheel to a bottle discharge station at a circumferentially spaced peripheral location.

These known star wheel type of transfer mechanisms work well in bottling plants to transfer glass bottles from one treatment station to another, and by reason of the rigid nature of glass bottles, the engagement of the bottles in the peripheral pockets of the star wheels is more that sufficient to maintain the bottles steady in an upright mode as they

move from one station to another, and this is of particular important in the transfer of empty bottles to the filling station, and the transfer of filled bottles from the filling station to a capping station.

However, while there still exists a substantial market for bottling plants which can handle glass bottles, there is a growing demand for bottling plants which can handle bottles which are made of moulded plastics material. Plastics material has the advantage of being (a) lighter in weight and (b) less liable to break or be punctured if dropped or roughly handled, and for the non-returnable container market is a preferred material compared with glass bottles.

However, given that plastics bottles are, at least under present legislation, not generally expected to be returned and recycled, but merely to be disposed of, there are strong commercial pressures to minimise bottle costs, and which in practice translates into reduction of wall thickness as much as possible to reduce the weight of plastics material utilised in the moulding of the bottle.

Initially, moulded plastics bottles have been formed with substantial wall thickness, either to give reassurance to customers that the bottle will be as robust as a glass bottle in normal handling of the bottle i.e. the wall of the bottle will not buckle during handling of a bottle from shelf to supermarket trolley, from trolley to car boot, and to a storage shelf at home.

Also, in the early stages of moulding of plastics bottles, plastics material and methods of moulding the material were not as advanced as now, and therefore early designs of plastics bottles had quite substantial wall thicknesses, and so the starting point for most designers of bottling plant, in carrying out any re-design to handle plastics bottles, has been to continue to use tried and tested technology used with glass bottles e.g. to continue to use star wheel type transfer mechanisms to engage the main large diameter body part of each bottle. Designers have therefore sought to carry out minor modifications only, to take into account the nature of the new materials (moulded plastics) being used to make bottles.

This approach may reflect a conservative view of a mature industry, but it is understandable at least in the circumstances of the early stages of development of moulded plastics bottle technology. Also, while moulded plastics bottles have had substantial wall

thickness (so that the main body part of the bottle has been relatively rigid), it has been reasonably straightforward to adapt existing star wheel technology in order to transfer moulded plastics bottles through the various treatment stations of a typical bottling plant.

However, advances in the technology of the moulding of plastics bottles have now reached a stage in which bottles can be made which have more than sufficient tensile strength, and rupture resistance, to withstand stresses in general handling, (and even stresses caused by dropping a full bottle onto the floor), despite the fact that the wall thickness is much reduced compared with early stages of manufacture.

This reduction in wall thickness reduces the rigidity of the bottle structure, and shows itself by the ability of the user to indent the wall of the bottle, or buckle the bottle wall, even when it is filled with liquid.

The reduction in rigidity i.e increased flexibility, of moulded plastics bottles means that existing transfer mechanisms (star wheels) which are acceptable for handling the large diameter part of glass and rigid plastics bottles, can no longer be used with thin walled plastics bottles and especially in the critical stage of transfer of empty bottles to a filling station, and of filled bottles from the filling station to the capping station. Thus, it is necessary to hold the bottles steady (and without buckling) during these transfer stages, and which is no longer possible with glass bottle transfer technology.

It is true that there have been attempts to adapt glass bottle transfer technology to suit flexible thin walled plastics bottles, but these developments involve providing support for bottles under the neck ring with a high level plastics or stainless steel starwheel, and involve adding substantial complexity to the design and manufacture of the star wheels, and reduce further the flexibility of the machines due to size change complexity.

The present invention has therefore been developed by approaching the problem from a radically different perspective i.e. not just by seeking to adapt existing technology, but by designing completely new handling equipment which is able to effect a transfer of plastics bottles via completely different means.

In the moulding of plastics bottles, it is normal practice to provide a strengthened neck portion, which has a greater wall thickness than the main body part of the bottle, and which is therefore more rigid (and also because it is of reduced diameter and is therefore less susceptible to buckling under radial load). It is usual to provide a rigid annular collar

or "neck ring" on the neck portion, spaced a short distance below the mouth of the bottle, and which can be engaged by guide components which assist in the guidance of the bottles through the plant. However, up to now, much of the guiding function has still been by use of the pocketed star wheels engaging the main body parts of the bottles, and the guidance by engaging with the annular collars has been auxiliary guidance only, and to assist in the main guidance provided by the star wheels i.e. to maintain the bottle steady and in an upright mode.

The invention proposes, in preferred arrangements, to dispense with need for star wheels (or adaptations thereof) to engage the large diameter body parts of bottles and can rely upon a novel guidance system which engages only the annular collar in a suitably rigid manner that a bottle can be transferred empty to a filling station, and filled with liquid at the filling station and then transferred to a capping station, with the bottle remaining steady and upright throughout.

The invention therefore provides a transfer mechanism which may be provided at any one or more location along the path of travel of a bottle through the various treatment stations of a bottling plant.

According to a first aspect of the invention there is provided a handling apparatus for use in a bottling plant to handle bottles having neck rings to assist with the handling of the bottles, with each neck ring being located a short distance below the mouth end of the bottle and having upper and lower engaging surfaces. in which the apparatus has a feed arrangement which is operative to feed a train of empty bottles along a predetermined guide path and which comprises:

a rotatable feed member having a shaped peripheral edge which is engageable with part of the upper and lower engaging surfaces of each neck ring to allow each bottle to be suspended from its neck ring in an upright mode, said feed member being rotatable about an upright axis extending generally parallel to the longitudinal axes of the bottles in order to feed the bottles along the predetermined guide path; and

a fixed guide which is curved, as seen in plan, so as to follow at least part of the path of travel of the peripheral edge of the feed member, and to define a guide track with the feed member having an entry end for receiving a train of bottles and a discharge end from which the bottles can be transferred to the bottling plant, said guide providing a

support surface on which part of the lower engaging surface of the neck ring of each bottle can be supported as the bottle moves from the entry end to the discharge end of the track.

Preferably, a top guide is co-operable with the guide track and arranged to engage the mouth end of each bottle in order to maintain the bottle in a required mode as it moves along the guide track, ready for feeding to the bottling plant.

Thus, a train of empty bottles can be fed along the guide track, with each bottle being maintained in an upright mode (usually substantially vertical), in order to feed the bottles to the plant and then to undergo successive treatment by various treatment stations e.g. filling, capping and packaging. This handling of the bottles therefore, in practice, prevents the bottles from twisting away from the vertical and avoids possible risk of mis-feeding into subsequent transfer mechanisms in the plant e.g. a pick-up starwheel.

The rotatable feed member may take the form of a rotatable disk having an edge profile to match that of the neck rings, and which usually may comprise an upper frusto-conical surface which extends downwards and radially inwards to engage an upper conical engaging surface of each neck ring, and a substantially horizontal surface to support a horizontal surface of each neck ring.

The top guide may comprise a guide plate secured to the upper surface of the disk, and which overlies the guide track and therefore is able to press downwardly (when necessary) onto the mouth end of each bottle and thereby assist in maintaining the upright mode (and avoid mis-feeding).

This novel and inventive arrangement of a handling apparatus according to a first aspect of the invention does not require any holding of the main larger diameter cylindrical portion of a bottle, as hitherto, in that each bottle is held securely via its neck ring, with the engagement being with both the upper and lower surfaces of the neck ring, and also preferred assistance from the top guide when necessary, all of this maintaining the bottle in an upright mode as it is fed into the bottling plant.

According to a further aspect of the invention there is provided a handling apparatus for use in a bottling plant to handle bottles having neck rings to assist in the handling of the bottles, with each neck ring having upper and lower engaging surfaces, in which the apparatus has a transfer arrangement which is operative to transfer a train of bottles along a predetermined guide path in order to transfer the bottles from one treatment

station to another treatment station of the plant, the transfer arrangement serving to convey the bottles one by one, and with predetermined spacing between successive bottles, and comprising:

a rotatable transfer member having peripherally spaced receiving pockets each shaped to receive a respective neck region of a bottle, the transfer member being rotatable about an upright axis extending generally parallel to the longitudinal axes of the bottles in order to transfer the bottles along the predetermined guide path with predetermined spacing between successive bottles;

a profiled edge provided along each pocket and which is engageable with part of the upper and lower engaging surfaces of each neck ring to allow each bottle to be suspended from its neck ring in an upright mode; and

a fixed guide which is curved, as seen in plan, so as to follow at least part of the path of travel of the pockets of the transfer member, and to define a guide track with the transfer member having an entry end for receiving a train of bottles from said one treatment station and a discharge end from which the bottles can be transferred to said further treatment station, said guide providing a support surface on which part of the lower engaging surface of the neck ring of each bottle can be supported as the bottle moves from the entry end to the discharge end of the track.

The transfer member may comprise a rotatable disc having scallops arranged at peripherally spaced locations on its outer periphery, each forming a respective pocket into which the respective neck region of a bottle can be received. The peripheral spacing apart of the pockets provides sufficient spacing between successive bottles, as they are fed one by one for treatment in the various treatment stations in the bottling plant.

When transferring between transfer members, it may be desirable to fit a top guide plate (similar to the one on the (input) rotatable feed member), to keep the bottles substantially vertical during transfer.

By way of example only, the handling apparatus according to the further aspect of the invention may be provided between a filling station and a capping station. Alternatively, the handling apparatus of the further aspect of the invention may receive a train of bottles from the handling apparatus of the first aspect of the invention, and serve to convey the train of bottles to a filling station.

As mentioned above, the neck ring of a moulded plastics bottle usually has a conical upper surface and a substantially horizontal lower surface, and therefore the profiled edge provided along each pocket will be correspondingly shaped i.e. having a downwardly and radially inwardly extending upper engaging surface, and a lower substantially horizontal surface, and which therefore allows part of the neck ring of each bottle to be snugly located in the profiled edge of each pocket, whereby the bottle can be suspended in an upright mode, and be maintained in this mode as the bottle is conveyed along the guide path from one treatment station to another.

The fixed guide, as mentioned above, supports part of the lower engaging surface of the neck ring of each bottle, and will usually be arranged at substantially the same level as the lower engaging surface of the profiled edge of each pocket, and serves to hold the neck region of each bottle captive, and in an upright mode.

The rotation of the transfer disk causes advance of the bottles, one by one, along the guide path, and in timed and spaced sequence, from one treatment station to another.

Preferred embodiments of handling apparatus according to the invention will now be described in details, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 is a schematic plan view of a first embodiment of handling apparatus according to the invention, and comprising a feed arrangement for feeding a train of empty bottles along a predetermined guide path to a bottling plant for subsequent passage through various treatment stations of the plant;

Figure 2 is a side view of the cooperating parts of the feed arrangement shown in Figure 1, and showing how a bottle can be suspended from its neck ring and be moved along a guide path in an upright mode;

Figure 3 is a plan view of a rotatable transfer disk, having a peripherally spaced series of receiving pockets, and forming part of a second embodiment of the invention;

Figure 3a is a sectional view showing the edge profile of one of the pockets;

Figure 3b is a detailed schematic view showing engagement of a neck profile of a bottle with the profiled edge of one of the pockets on the periphery of the transfer disk shown in Figure 3, and cooperating with a fixed outer guide;

Figure 4 is a view, similar to Figure 3, showing a modified peripheral edge shaping of a transfer disk, similar to the illustration of Figure 3;

Figure 5 is a plan view showing two separate transfer disks, operating in tandem, so as to form an S-shaped combined guide path for a train of bottles;

Figure 6 shows different shapes of neck region and neck ring profiles provided on different shapes of moulded plastics bottles, which can be handled by apparatus according to the invention;

Figure 7 is a detailed view, to an enlarged scale, of an edge profile of a rotatable feed or transfer member, to engage a neck ring of a bottle;

Figure 8 is a detailed view of a typical neck ring bottle profile engaging the profiled edge; and

Figures 9 to 12 are, respectively, side, plan and enlarged detail views of a practical construction of bottling plant incorporating both aspects of the invention.

Referring first to Figures 1 and 2 of the drawings, this shows in diagrammatic form a first embodiment of handling apparatus according to the invention, for use in a bottling plant, and to handle bottles having neck rings which assist in the handling of the bottles, with each neck ring being located a short distance below the mouth end of the bottle, and having upper and lower engaging surfaces.

The apparatus shown in Figures 1 and 2 comprises a feed arrangement which is operative to feed a train of empty bottles along a predetermined guide path, in order to supply empty bottles to a bottling plant, through which the train of bottles will pass and to undergo successive treatments e.g. rinsing, filling, capping and packaging.

The feed arrangement is designated generally by reference 10 and comprises a rotatable feed member in the form of a rotating disk 11, which has a shaped peripheral edge 12, as shown in Figure 2, which is engageable with part of the upper and lower engaging surfaces of a neck ring, as shown in Figure 2. Thus, Figure 2 shows a moulded plastics bottle 13 having a large diameter main body portion, and an upper neck region 14 provided with a neck ring 15 spaced a short distance downwardly of the upper mouth end 16 of the bottle 13. The ring has an upper conical engaging surface 17 and a lower horizontal engaging surface 18.

The shaped peripheral edge 12 of the rotating disk 11 engages with part of the upper and lower surfaces 17, 18 of the neck ring, and this allows each bottle 13 to be suspended from its neck ring 15 in an upright mode, as the bottle is fed along the predetermined guide path by rotation of the disk 11. The disk 11 will be rotatable about an upright axis extending generally parallel to the longitudinal axes of the bottles, in order to feed the bottles along the predetermined guide path which has an entry end 19 and a discharge end 20, as shown in Figure 1. A train of bottles is supplied along a guide, and the bottles are fed one by one to a guide track 50 which is defined between the outer periphery 12 of the disk 11 and a fixed guide 21. The fixed guide 21 is curved, as shown in plan in Figure 1, so as to follow at least part of the path of travel of the peripheral edge 12 of the feed disk 11, and this defines the guide track 50 with the feed disk 11 having entry end 19 which receives the train of bottles, and discharge end 20 from which the bottles can be transferred to the bottling plant.

The guide 21 provides a support surface, as shown in Figure 2, on which part of the lower engaging surface 18 of the neck ring 15 of each bottle can be supported, as the bottle moves from the entry end 19 to the discharge end 20 of the guide track 50.

A top guide is provided, which preferably takes the form of an overlying guide plate 22, mounted on the upper surface of rotating feed disk 11, and which serves to engage with the mouth end 16 of each bottle, when necessary, in order to maintain the bottle in an upright mode as it moves along the guide track.

Therefore, the handling apparatus 10 as shown in Figures 1 and 2 can feed a train of empty bottles along the guide track 50, with each bottle being maintained in an upright mode, so as to feed the bottles to the plant where they can undergo successive treatment. By way of example only, Figure 1 shows the feeding of a train of bottles 13 to a rotatable transfer member, designated generally by reference 30, and which comprises a further embodiment of handling apparatus according to the invention.

The transfer arrangement 30 is operative to transfer a train of bottles along a predetermined guide path also, but to transfer the bottles from one treatment station to another treatment station in a bottling plant, and the transfer arrangement serving to convey the bottles one by one, and with predetermined spacing between successive bottles.

The rotatable transfer arrangement takes the form of a so-called star wheel, having peripherally spaced receiving pockets 31, each shaped to receive a respective neck region of a bottle, as can be seen in Figure 3b. Figure 3 shows in more detail the shape and arrangement of the transfer member 30, in a practical embodiment. As can be seen in Figure 3a and 3b, each pocket 31 on the outer periphery of the transfer member 30 has an edge profile which closely matches that of the neck ring 15, in that there is an upper surface 32 which extends downwardly and radially inwardly of the periphery, and which engages the conical upper engaging surface or shoulder 17 of the neck ring 15. The profile on the transfer member 30 also includes a lower horizontal engaging surface 33, which engages with the lower engaging surface 18 of the neck ring 15. Also, a fixed outer guide 34 cooperates with the transfer member 30, to define the guide track, and performs a dual function of a) engaging with the lower engaging surface 18 of the neck ring 15, and b) also holds the neck region of the bottle captive so that it is constrained to follow the required guide track.

As with the feed disk 11 of Figures 1 and 2, the cooperative engagement between the transfer member 30 and the outer guide 34 provides for suspension of a bottle, and maintaining an upright attitude throughout, and without need for any separate guidance and handling of the lower larger diameter portion of the bottle. Empty bottles therefore can readily be guided to a filling station to be charged with liquid, and then be moved onwardly to a capping station, and finally to a packaging station. At least during transfer to the filling station, and onwards to the capping station, the bottles are maintained reliably in an upright mode, and solely via the captive guidance and vertical support of each bottle via the neck region, with the cooperative engagement with the neck ring being with both the upper and lower surfaces of the neck ring.

Figure 4 shows a further practical design of transfer disk 130 having shaped pockets 131, and Figure 5 schematically illustrates a tandem arrangement of successive transfer disks 40 and 41, which can define an S-shaped combined guide path for a train of bottles as they move through a bottling plant from one station to another.

Figure 6 shows different shapes of bottle (large, medium and small) and neck regions thereof, and cooperative shaping of edge profiles to engage therewith.

Figures 7 and 8 show further details of edge profile for cooperation with a neck ring of a bottle.

The description of the two preferred embodiments, with reference to the accompanying drawings, show examples of first and second aspect of the invention. Desirably, the two embodiments are incorporated in a single bottling plant, and provide advantageous handling of moulded plastics bottles having neck rings.

A practical embodiment of bottling plant, incorporating both aspects of the invention, is shown in more detail in Figures 9 to 12 of the accompanying drawings. Figure 9 is a side view of a bottling plant having a number of transfer discs, for use in transferring bottles between treatment stations, and shows two transfer discs only for ease of illustration, namely transfer disc 200 which receives a train of bottles from a feed arrangement 201 including transfer disc 202, and which are similar to the schematic illustration of the feed arrangement shown in Figures 1 and 2. There is also shown a second transfer disc 203, and there will also be a further transfer disc (not shown) which receives a peripherally spaced train of bottles from discharge end 204 of the first transfer disc 200, and such further disc then transfers the bottles from one treatment station to another, and then delivers the bottles to the input end 205 of transfer disc 203.

The feed arrangements 201 has an adjustable infeed disc to drAW bottles into the infeed neck-trapper profile 205 of transfer disc 200, and a cam operated mechanism operates on the neck-trapper profile 205 to grip the bottle by the neck when the roller leaves the cam. An infeed neck-trapper opening cam arrangement 206 is shown, operating on the neck-trapper profile 205 so that an incoming bottle is gripped. A discharge neck-trapper cam 207 operates on the profile so that the bottles can be released before being discharged from discharge end 204.

The transfer disc 200 has an associated fixed guide track 208 associated therewith, and extending around part of its outer periphery, and transfer disc 203 has a similar fixed guide track 209 associated therewith, and having input end 205 and discharge end 210. Cam operated arrangements work with the transfer disc 203, in similar manner to the neck trapper profiles of the first disc 200.

Figures 11 and 12 are enlarged detail views of the details of Figure 9, with Figure 11 being a section through the side of a neck trapper profile, and Figure 12 being a section through the centre of a neck-trapper profile.

To conclude, in existing designs of bottling plant, designed to handle PET filling, the bottles are fed directly by an air conveyor system. On the air conveyor, the bottles are conveyed by the neck ring, and on reaching the bottle filler, the bottles are separated to so-called "filler pitch", and using a rotating feed screw. From the feed screw, the bottles pass to a neck support system which supports the bottle under the neck ring only, and maintains stability of the bottles i.e. controls bottle movement by star wheels and guides engaging the main cylindrical part of the bottle beneath the neck ring. In the known arrangement, the system of star wheels transfers the bottles from the feed screw to the rinser, from the rinser to the filler, from the filler to the capper, around the capper, and from the capper to the discharge conveyor.

One particular problem with this existing system is that, when a container size change takes place, usually the feed screw also will require to be changed, and all of the lower star wheels and guides (engaging the main cylindrical part of the bottle) have to be changed also to suit the new container size. This changeover is time consuming, and therefore limits the flexibility of the existing design.

There are some existing designs of variable pocket sized star wheel (to engage the lower large diameter body of each bottle), but these are cumbersome and expensive to manufacture, and even with these in place, the outer guides still require changing.

The feed arrangement according to the first aspect of the invention (feeding apparatus 10) eliminates the requirement for the feed screw, and utilises instead a rotating feeder disk which centralises and separates the bottles into the first downstream star wheel. With this solution, there are no parts which require to be changed, when "size changing" the machine, provided that the new bottles share the same neck finish.

In the handling apparatus according to the second aspect of the invention, this also provides more flexibility to the filling part at least of the bottling plant. Thus, the new handling system has been developed which holds the bottle captive via the neck finish alone, and this is achieved by locating the neck support ring of the bottle in a profiled groove in a pocketed star wheel, preferably made of stainless steel, and cooperating with

an outer guide. This eliminates the need for lower star wheels and lower guides (previously necessary to engage the lower main cylindrical part of the bottle) since the bottle cannot move laterally when suspended by the neck in the new design of handling system, once it has been firmly located within the groove arrangement provided by the cooperation between the profiled outer periphery of the star wheel and the cooperating fixed guide.

Claims:

1. A handling apparatus for use in a bottling plant to handle bottles having neck rings to assist with the handling of the bottles, with each neck ring being located a short distance below the mouth end of the bottle and having upper and lower engaging surfaces, in which the apparatus has a feed arrangement which is operative to feed a train of empty bottles along a predetermined guide path and which comprises:

a rotatable feed member having a shaped peripheral edge which is engageable with part of the upper and lower engaging surfaces of each neck ring to allow each bottle to be suspended from its neck ring in an upright mode, said feed member being rotatable about an upright axis extending generally parallel to the longitudinal axes of the bottles in order to feed the bottles along the predetermined guide path; and

a fixed guide which is curved, as seen in plan, so as to follow at least part of the path of travel of the peripheral edge of the feed member, and to define a guide track with the feed member having an entry end for receiving a train of bottles and a discharge end from which the bottles can be transferred to the bottling plant, said guide providing a support surface on which part of the lower engaging surface of the neck ring of each bottle can be supported as the bottle moves from the entry end to the discharge end of the track.

2. Apparatus according to claim 1, including a top guide co-operable with the guide track and arranged to engage the mouth end of each bottle in order to maintain the bottle in a required mode as it moves along the guide track, ready for feeding to the bottling plant.

3. Apparatus according to claim 1 or 2, in which the rotatable feed member comprises a rotatable disc having an edge profile to match that of the neck rings.

4. Apparatus according to claim 3, in which the edge profile comprises an upper frusto-conical surface which extends downwards and radially inwards to engage an upper conical engaging surface of each neck ring, and a substantially horizontal surface to support a horizontal surface of each neck ring.

5. Apparatus according to claim 3 or 4, when appendant to claim 2, in which the top guide is secured to the upper surface of the disc, and which overlies the guide track and therefore is able to press downwardly, when necessary, onto the mouth end of each bottle and thereby assist in maintaining the upright mode of the bottle.

6. A handling apparatus for use in a bottling plant to handle bottles having neck

rings to assist in the handling of the bottles, with each neck ring having upper and lower engaging surfaces, in which the apparatus has a transfer arrangement which is operative to transfer a train of bottles along a predetermined guide path in order to transfer the bottles from one treatment station to another treatment station of the plant, the transfer arrangement serving to convey the bottles one by one, and with predetermined spacing between successive bottles, and comprising:

a rotatable transfer member having peripherally spaced receiving pockets each shaped to receive a respective neck region of a bottle, the transfer member being rotatable about an upright axis extending generally parallel to the longitudinal axes of the bottles in order to transfer the bottles along the predetermined guide path with predetermined spacing between successive bottles;

a profiled edge provided along each pocket and which is engageable with part of the upper and lower engaging surfaces of each neck ring to allow each bottle to be suspended from its neck ring in an upright mode; and

a fixed guide which is curved, as seen in plan, so as to follow at least part of the path of travel of the pockets of the transfer member, and to define a guide track with the transfer member having an entry end for receiving a train of bottles from said one treatment station and a discharge end from which the bottles can be transferred to said further treatment station, said guide providing a support surface on which part of the lower engaging surface of the neck ring of each bottle can be supported as the bottle moves from the entry end to the discharge end of the track.

7. Apparatus according to claim 6, in which the transfer member comprises a rotatable disc having scallops arranged at peripherally spaced locations on its outer periphery, each forming a respective pocket into which the respective neck region of a bottle can be received.

8. Apparatus according to claim 6 or 7, including a top guide plate operative to keep the bottles substantially vertical during transfer between one transfer member and another transfer member.

9. Apparatus according to any one of claims 1 to 5, and provided between a filling station and a capping station of a bottling plant.

10. Apparatus according to claim 1, in combination with apparatus according to claim 6.

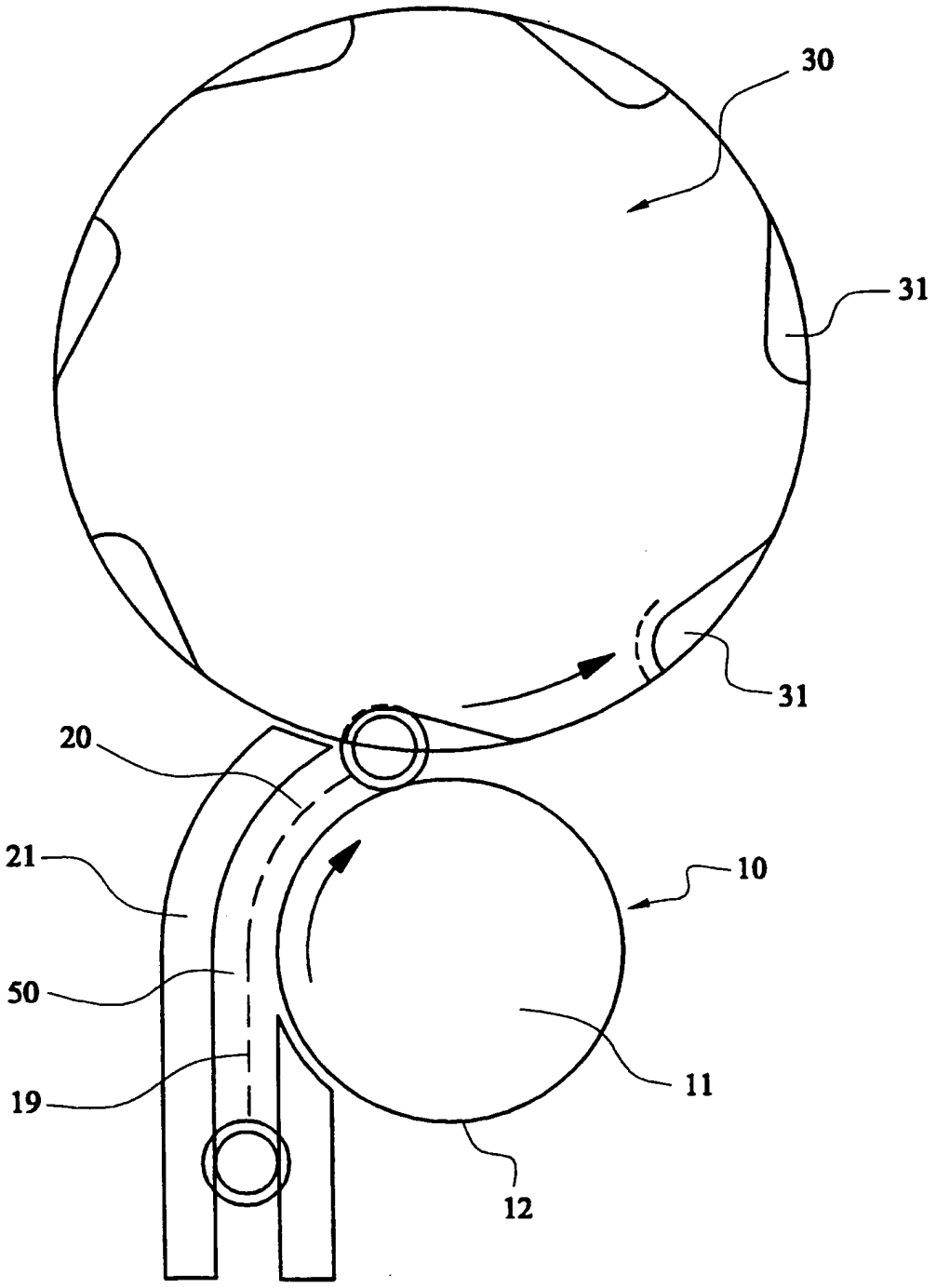

FIG. 1

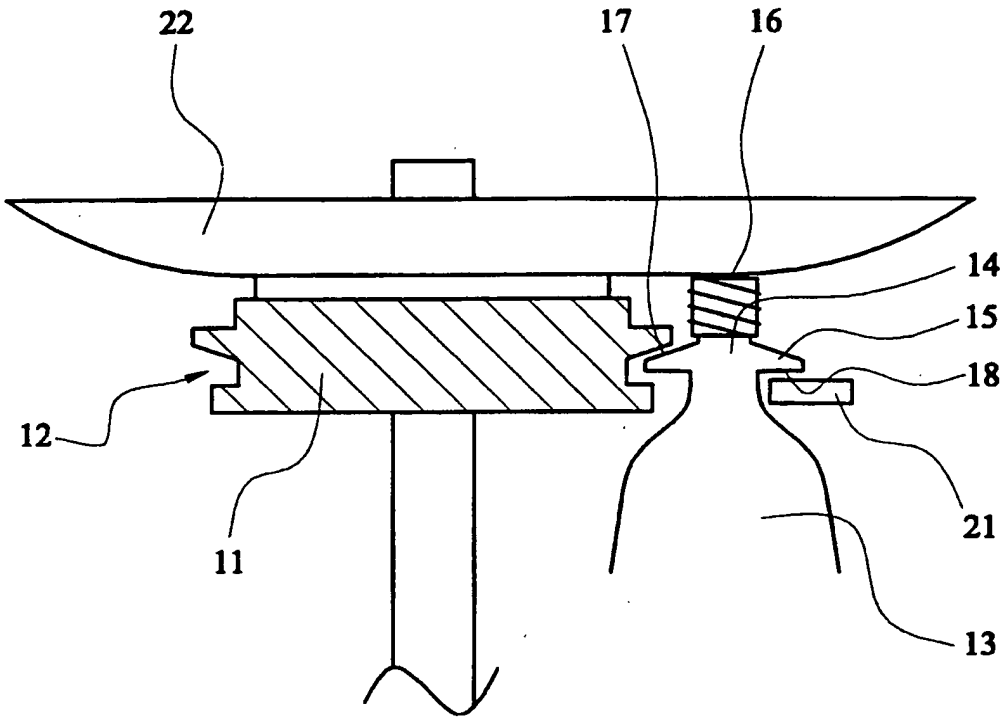

FIG. 2

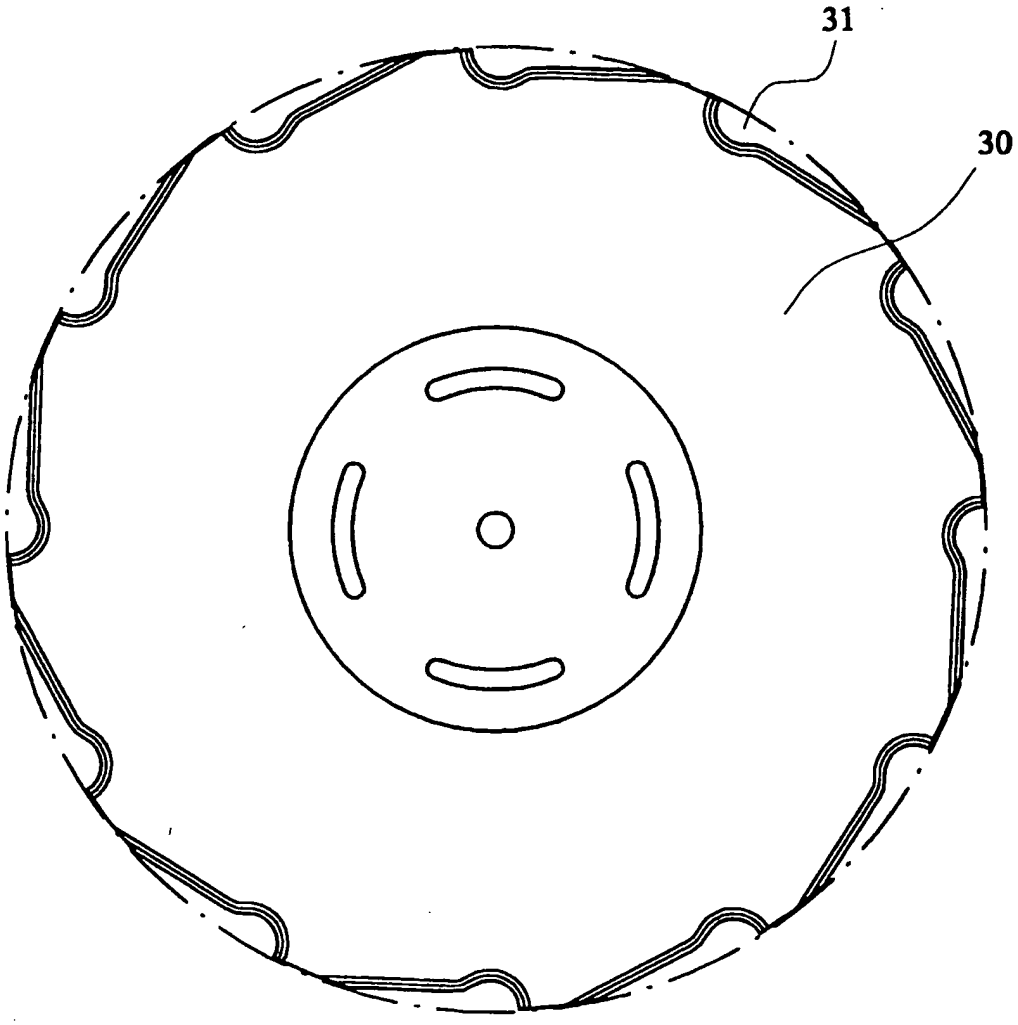

FIG. 3

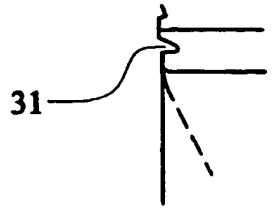

FIG. 3a

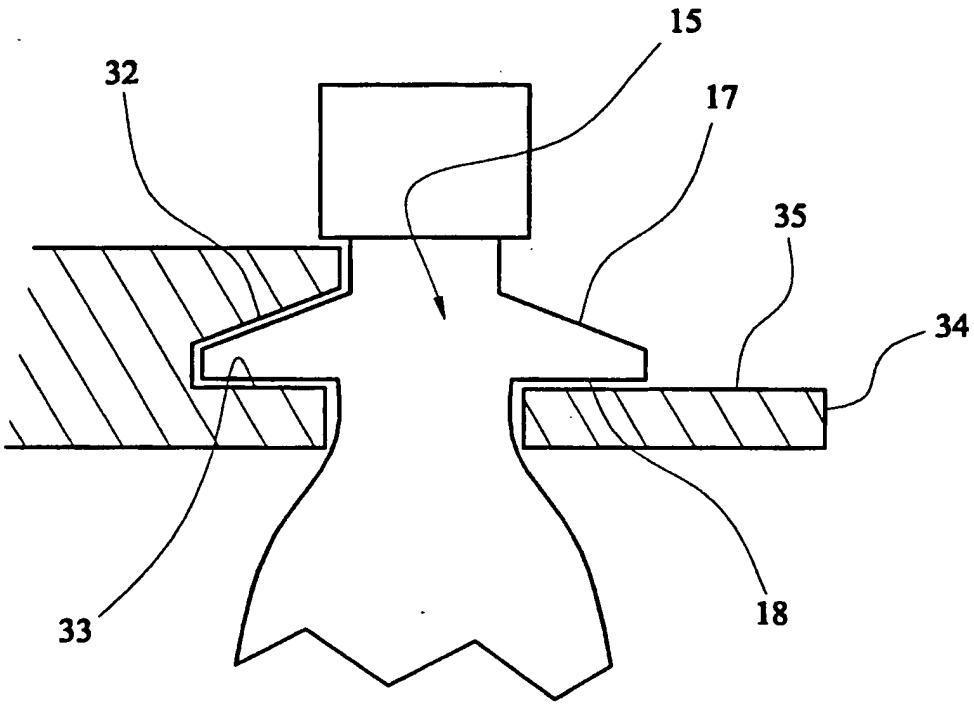

FIG. 3b

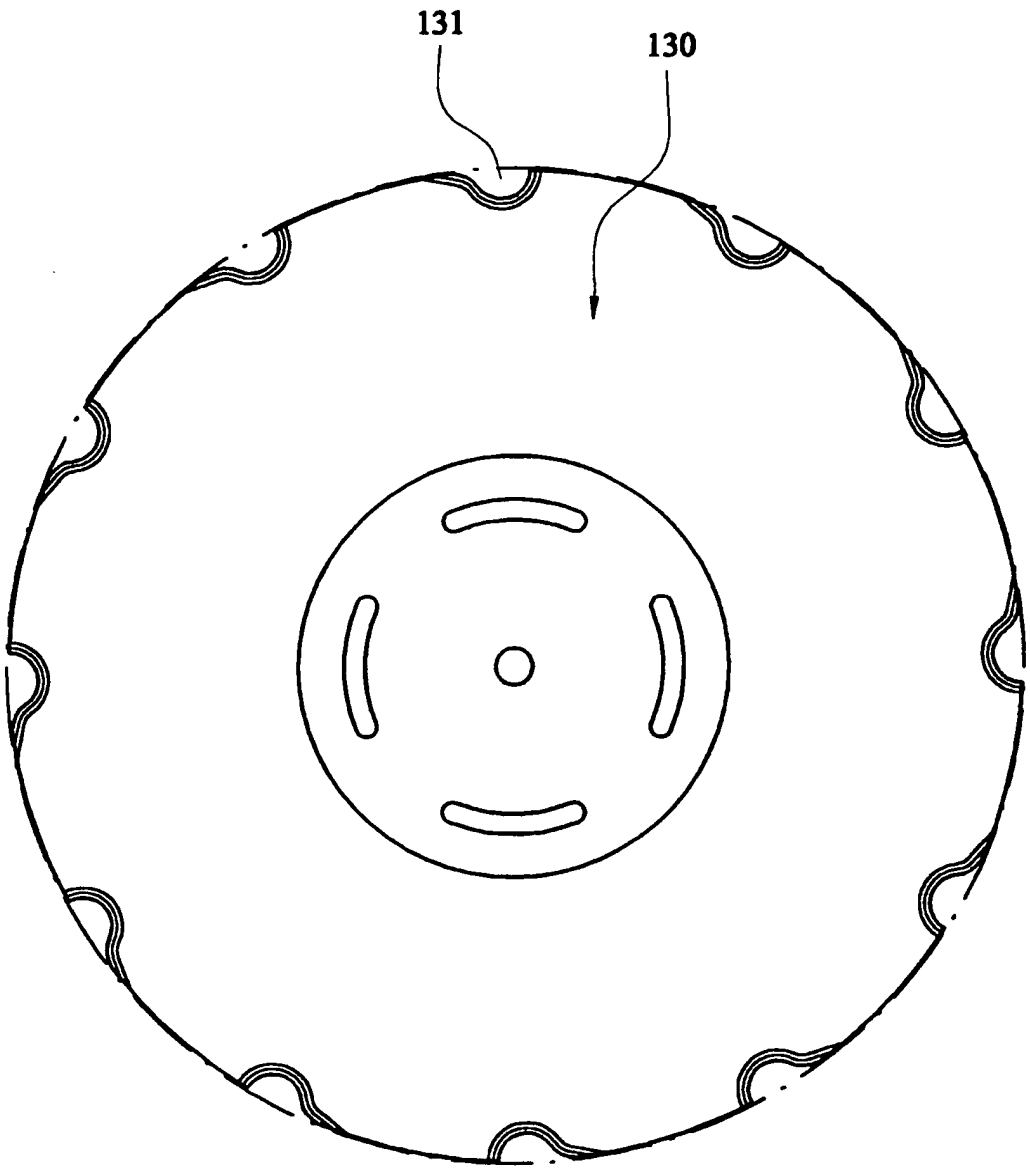

FIG. 4

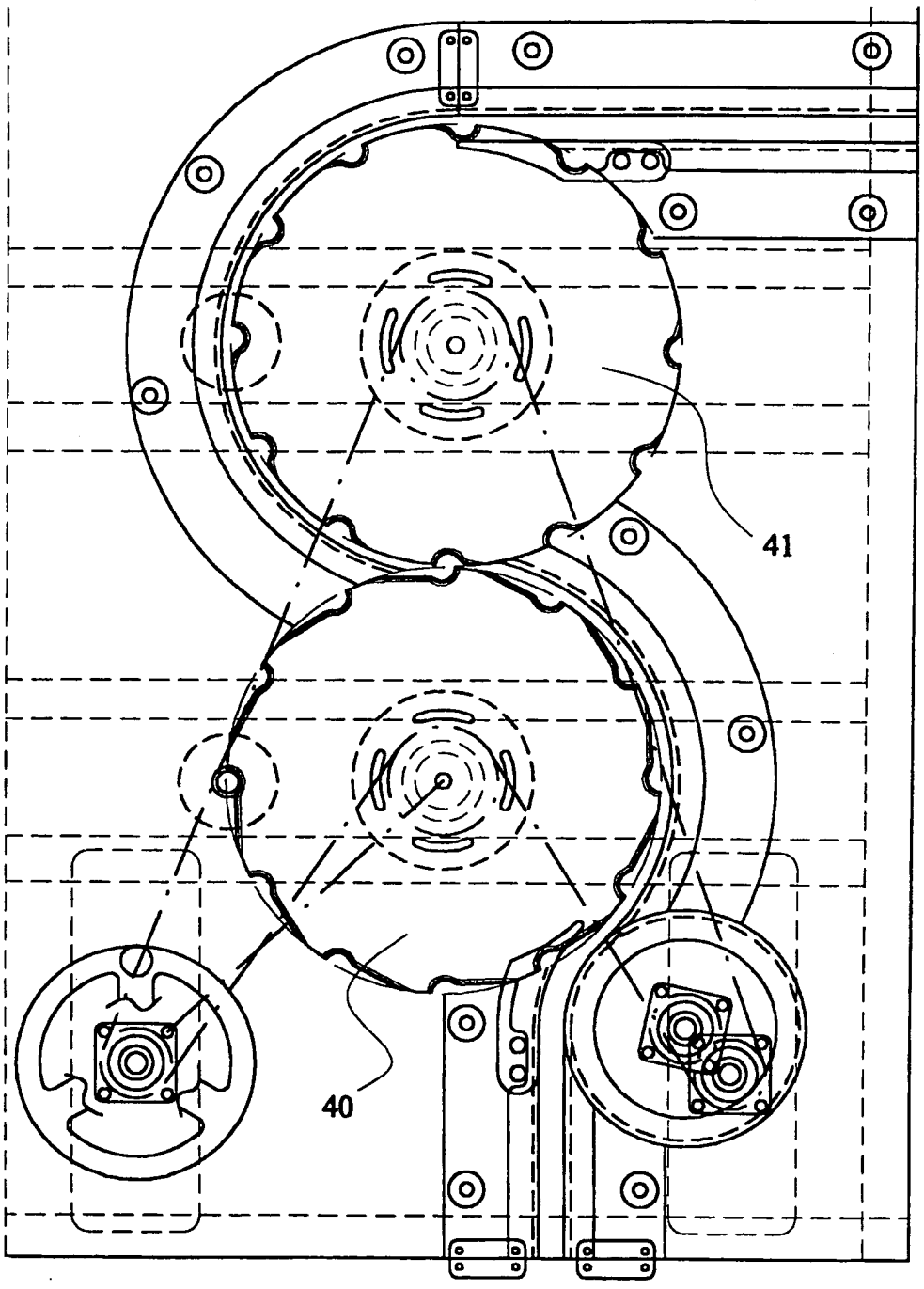

FIG. 5

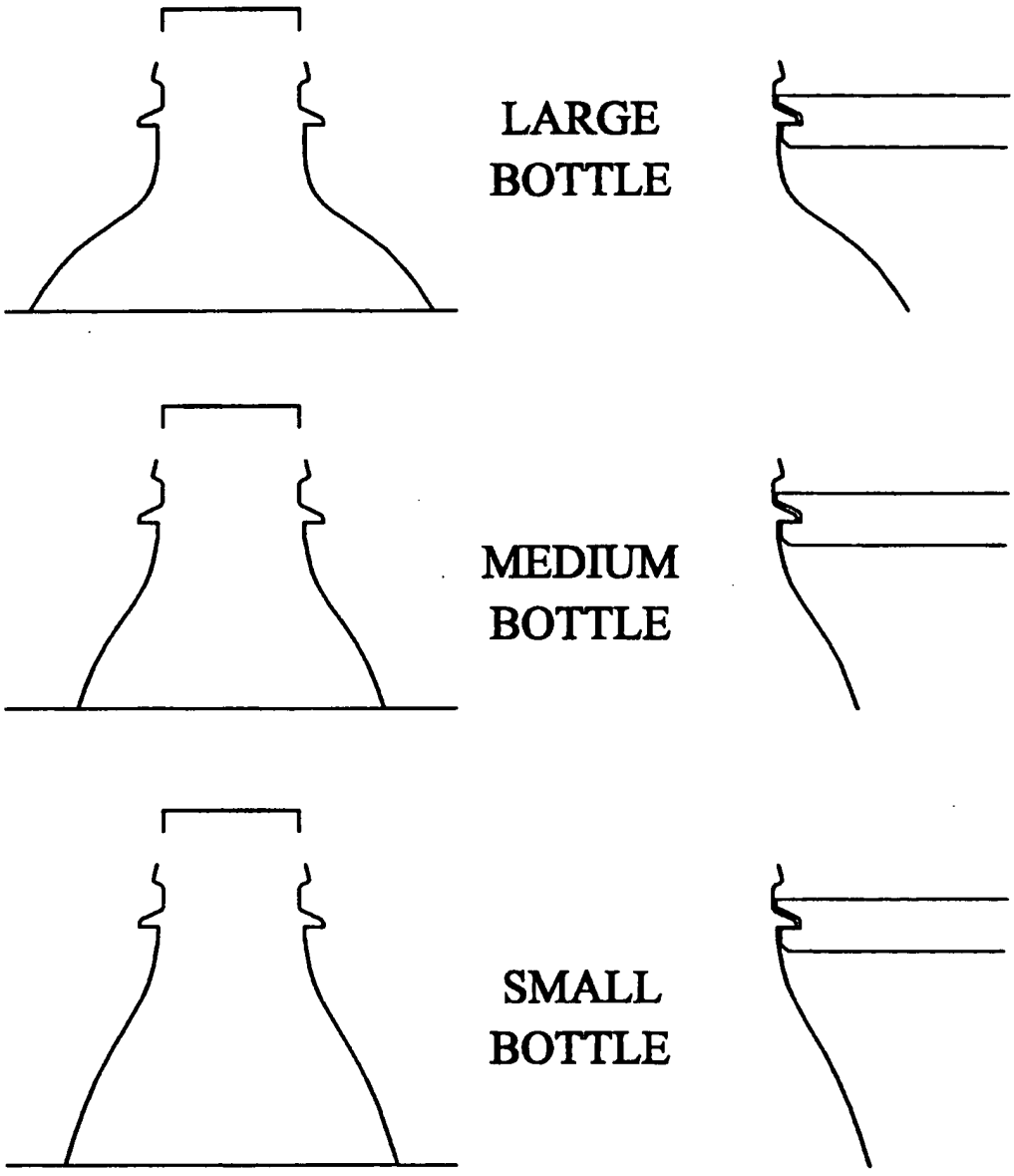

FIG. 6

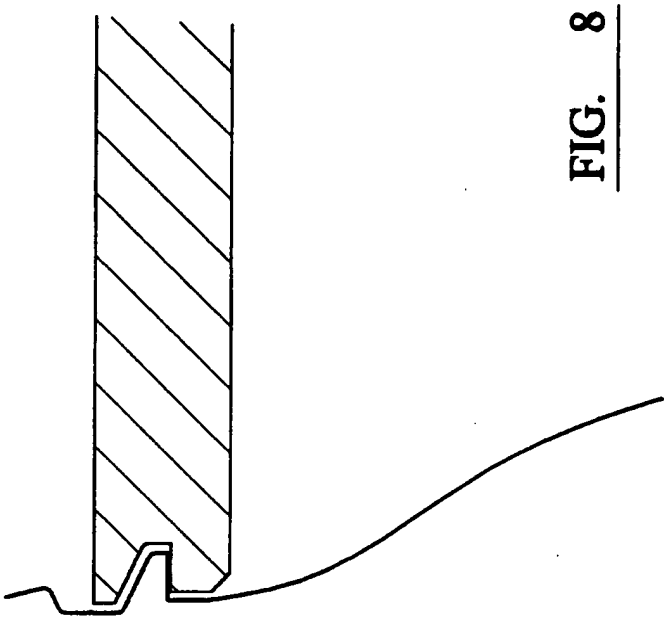

FIG. 8

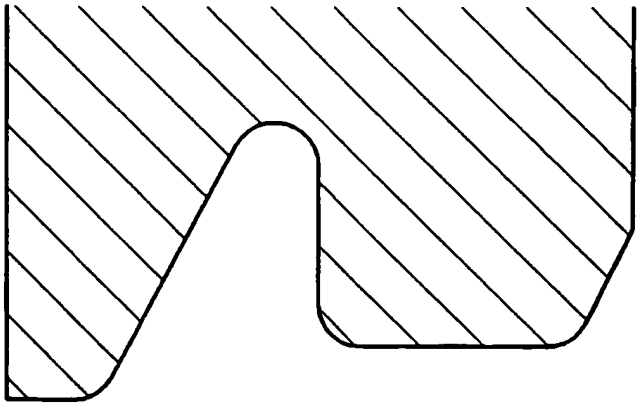

FIG. 7

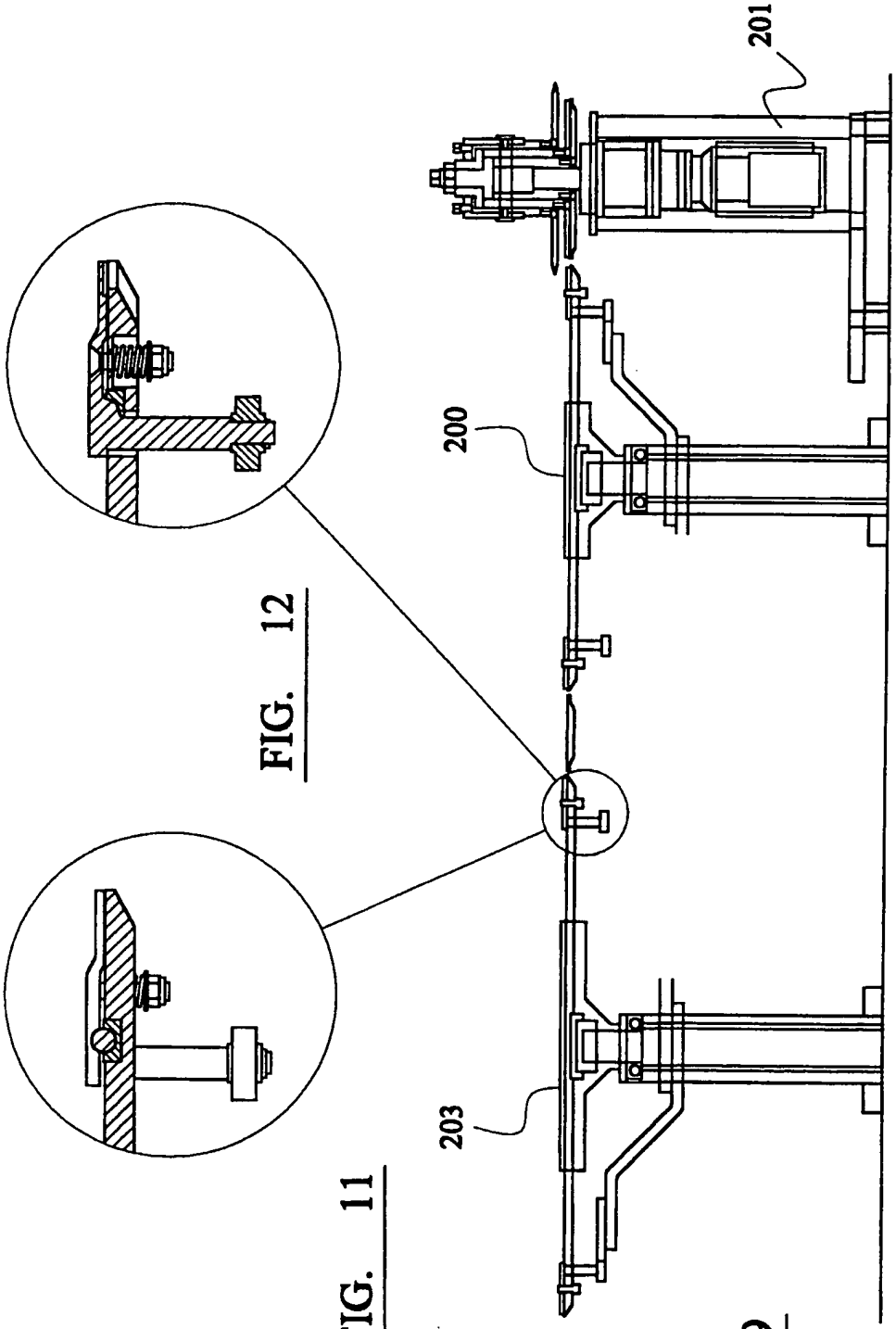

FIG. 12

FIG. 11

FIG. 9

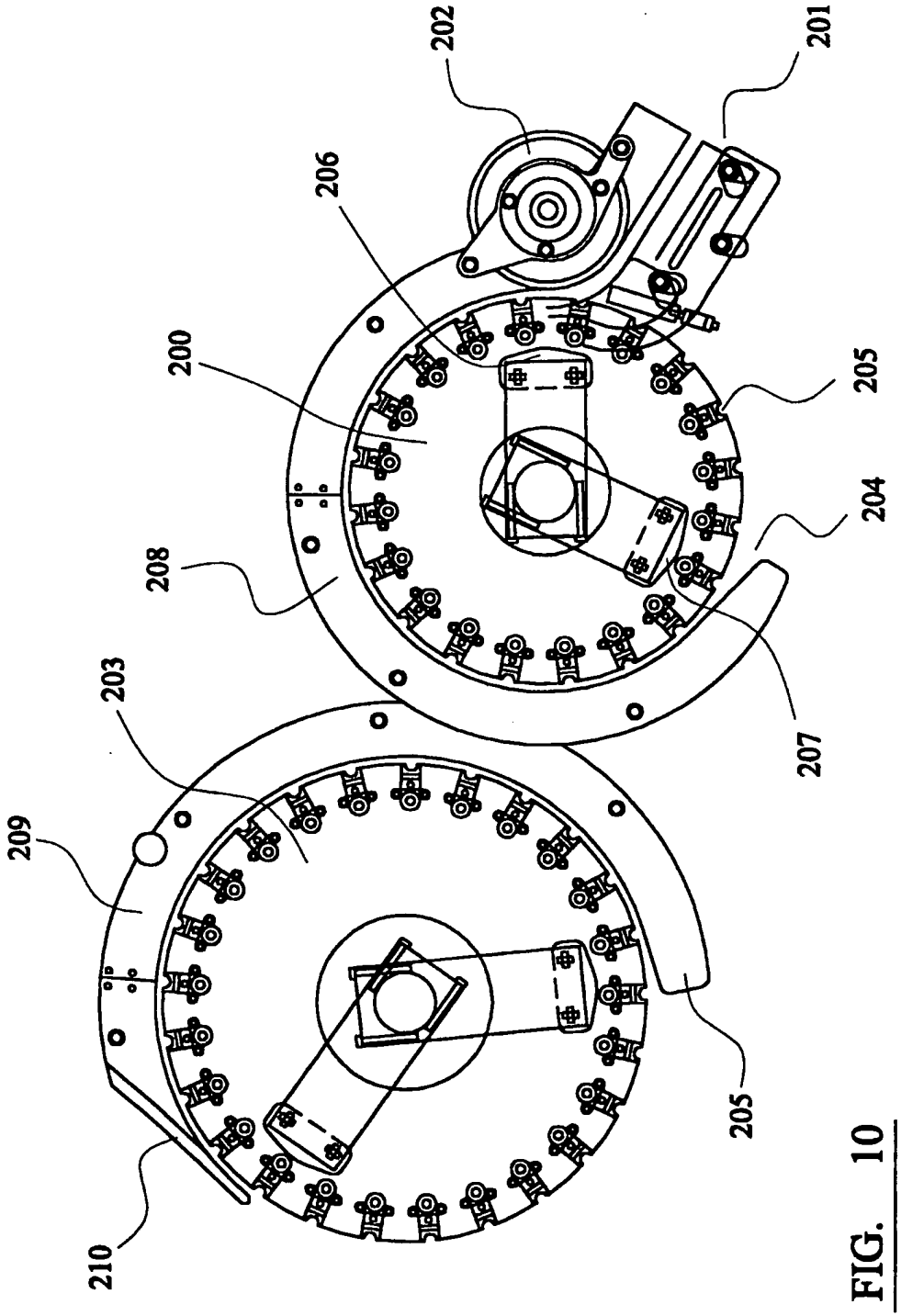

FIG. 10

INTERNATIONAL SEARCH REPORT

Inter tional Application No
PCT/GB 00/04694

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 B65G47/84 B65G29/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 B65G B67C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 837 016 A (GOLDCO INDUSTRIES) 22 April 1998 (1998-04-22) column 4, line 39 -column 4, line 58; figures 1,3 ---	1,6
A	FR 2 772 359 A (ADS) 18 June 1999 (1999-06-18) figures 1,2 -----	1,6

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
5 February 2001	15/02/2001

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax (+31-70) 340-3016	Lawder, M

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INTERNATIONAL SEARCH REPORT

Information on patent family members

Inter ·tional Application No
PCT/GB 00/04694

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		AU 721020 B	22-06-2000
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FR 2772359 A	18-06-1999	BR 9807375 A	14-03-2000
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